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Arum alpinum (Araceae) and its Distribution in the Eastern Mediterranean

By

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With 1 Figure

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Summary

BEDALOV M. & FISCHER M. A. 1995. *Arum alpinum (Araceae)* and its distribution in the Eastern Mediterranean. – Phyton (Horn, Austria) 35 (1): 103–113, 1 figure. – English with German summary.

Arum alpinum SCHOTT & KOTSCHY, a good species well distinct from *A. maculatum* L. as well as from *A. orientale* M. B. by tuber shape and spadix and spathe characters, is distributed not only in central Europe, S. Italy, S. France, Spain, and Crete but also in Evvia (= Euboea) and continental Greece. Specimens from around Istanbul remain doubtful (belonging rather to *A. orientale* than to *A. alpinum*).

Zusammenfassung

BEDALOV M. & FISCHER M. A. 1995. *Arum alpinum (Araceae)* und dessen Verbreitung in der Ost-Mediterraneis. – Phyton (Horn, Austria) 35 (1): 103–113, 1 Abbildung. – Englisch mit deutscher Zusammenfassung.

Arum alpinum SCHOTT & KOTSCHY ist eine gute Art, die sich sowohl von *A. maculatum* L. wie von *A. orientale* M. B. deutlich unterscheidet, und zwar in der Gestalt der Knolle, im Längenverhältnis Laubblattstiel zu Schaft und in Merkmalen von Spatha und Spadix. *A. alpinum* ist nicht nur im östlichen Mitteleuropa verbreitet, sondern auch in Südeuropa (es war bisher aus Spanien, Süd-Frankreich, Süd-Italien, Bulgarien, Nord-Griechenland und Kreta bekannt). Hier berichten wir nun über neue Funde aus Griechenland und diskutieren Belege aus der nordwestlichen Türkei (Umgebung von Istanbul), die vielleicht eher zu *A. orientale* als zu *A. alpinum* gehören.

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1. Introduction

Arum alpinum SCHOTT & KOTSCHY has been described on the basis of plants from the Transsylvanian Alps (SCHOTT 1851). Afterwards, many authors included *A. alpinum* within *A. maculatum* L. (e. g. RICHTER 1890, BECK-MANNAGETTA 1903, ASCHERSON & GRAEBNER 1904, ENGLER 1920, HAYEK & MARKGRAF 1933, RIEDL 1967), and it has also been redescribed as *A. maculatum* subsp. *danicum* PRIME 1961 and later recombined as *A. orientale* subsp. *danicum* (PRIME) PRIME 1980.

Rather often, it was also identified as "*A. maculatum* var. *immaculatum* REICHENB." (The characters given for this variety in the key of the varieties in RIEDL 1979 fit perfectly well to *A. alpinum*.) Our species has been even included in *A. italicum: A. i.* var. *lanceolatum* (BOISS. & HELDR.) ENGL. – After some early remarks by DIHORU 1970, it were TERPÓ 1971, 1973 and BEDALOV 1973a, b, 1976 who, based on morphological, cytotaxonomical and phytogeographical investigations, recognized this taxon as a well distinct separate species. Later, *A. alpinum* is treated by RIEDL 1979 as a subspecies of *A. orientale* M. B. and by PRIME 1980 as a synonym of *A. orientale* subsp. *orientale*. GUTERMANN & al. 1973, however, ranked our sib as a (micro)species within "*A. maculatum* agg." which comprises also *A. maculatum* and *A. italicum*. Recently, BOYCE 1989, 1993, likewise, treats *A. alpinum* at species rank.

Recent investigations in the genus *Arum* (TERPÓ 1971, 1973, BEDALOV 1973a, b, 1975a, b, c, 1976, 1977, 1978, 1980, 1981, 1982, 1983, 1994, BEDALOV & GUTERMANN 1982, BEDALOV & al. 1993a, b, BEDALOV & BRONIĆ 1994, BEDALOV & DRENKOVSKI 1994, GREUTER 1984, BOYCE 1989, 1993), however, revealed that *A. alpinum* differs not only from *A. maculatum* but also from *A. orientale*, *A. italicum* MILLER and *A. creticum* BOISS. & HELDR., i. e. from species with which *A. alpinum* often has been and frequently still is misidentified.

Although the differences between these species have been discussed in several of the papers mentioned above, it seems necessary and appropriate, before considering phytogeography, to sum up here what we consider the main diagnostic characters, in order to avoid future confusion.

2. Distinction from other species

Arum alpinum has a depressed-globose to discoid tuber (in a vertical to horizontal position); the leaves are usually not or only slightly sagittate and uniformly green; the peduncle (= scape) usually is about as long as the petiole; the limb (blade) of the spathe is (if flattened) ovato-lanceolate to elliptic-lanceolate and not more than about 2½ to 3 times as long as the tube (i. e. the lower, closed part of the spathe), pale greenish on the inner side or slightly purple on the inner border; the appendix of the spadix is more or less purple, uniformly cylindrical (= "vermiculate") or somewhat

enlarged at the top, but the stipe (= stalk) usually is not very distinct (i. e., the appendix is either not differentiated into a club and a stipe (or stalk), or it is, but with the basis of the club gradually tapering into the stipe); the whole spadix is usually about half the length of the whole spathe or slightly longer (rarely shorter); the upper sterile flowers are usually in 4–6(–8) rows; the male flowers are dark purple. It is a diploid (2n = 28), which has been confirmed several times and for different parts of the distribution area (see also PETERSEN 1989).

Therefore, we suppose that several diploid chromosome counts (2n = 28) under the names "*A. maculatum*" and "*A. italicum*" refer to plants belonging to *A. alpinum*, being misidentified: HAGERUP 1942, 1944: "*A. maculatum*" from Danmark; WCISŁO 1970: "*A. maculatum* f. *immaculatum*" from Poland; and even DAHLGREN & al. 1971 and NILSSON & LASSEN 1971: both "*A. italicum*" from Mallorca. (Unfortunately, up to now we did not succeed to examine the voucher specimens of these counts.)

A. alpinum differs mainly by its vertical (discoid to depressed-globose) tuber shape from both *A. maculatum* and *A. italicum* which show horizontal (cylindrical, rhizome-like) tubers. The peduncle in *A. maculatum* usually is a little longer than half of the petiole, and in *A. italicum* it is usually shorter than half of the petiole. The leaves in *A. maculatum* are oblong-hastate to -sagittate, either uniformly green or ± marked with ± dark purple spots; in *A. italicum* they are larger, usually more distinctly hastate, uniformely green or marked with bright spots and/or veins, but sometimes (also additionally) marked with dark purple spots. The spathe in *A. maculatum* is elliptical or broadly ovate-elliptical, pale greenish, sometimes marked inside with purple (blackish) spots, rarely totally suffused with purple. In *A. maculatum*, the spathe's limb is more than three times as long as the tube, in *A. italicum* usually it is even much longer and wider; in both species, thus, the spathe's limb is larger and longer than in *A. alpinum*. This differential character so far has not been observed consistently and has also so far not been stressed sufficiently in any descriptions of the species. (For a recent survey of the differential characters between *A. maculatum* and *A. alpinum* see also FISCHER 1994.) The appendix of the spadix in *A. maculatum* is purple or yellow and its distinctly enlarged upper part ("club") is at its base slightly tapering into a stipe which is as long as the upper part or slightly longer, while in *A. italicum* the upper part of the appendix is likewise as long or longer than the stipe, but more clearly separated from the stipe and mostly yellow. Finally, both species are polyploid: *A. maculatum* is a tetraploid (2n = 56), *A. italicum* is a hexaploid (2n = 84). For further differential characters of *A. maculatum* and *A. italicum* see BEDALOV 1975a and 1977, and for the chromosome counts given by different authors see PETERSEN 1989.

The other species often confused with *A. alpinum*, viz. *A. orientale*, *A. creticum* BOISS. & HELDR., and *A. idaeum* CONST. & GAND., share the

discoid-globose tuber, the always uniformly green leaves and the diploid chromosome number with *A. alpinum*, but they differ mainly in inflorescence characters: In *A. orientale*, the leaf blade is usually more elongate than in *A. alpinum*. In *A. orientale* subsp. *orientale* the spathe's limb is broadly ovate, pale greenish or ± purplish, while in subsp. *longispathum* it is elongated oblong-lanceolate and also pale greenish or purplish but along the border. In both subspecies the limb of the spathe is always more than 3 times as long as the tube and thus different from *A. alpinum*. In *A. orientale* subsp. *orientale*, the spadix is about as long as half of the spathe, sometimes a little shorter or a little longer (thus not different from *A. alpinum*), while in subsp. *longispathum* it is always distinctly longer than half the spathe; the spadix appendix-club, in *A. orientale*, is wider, cylindrical or slightly conical, dark violet to violet-brownish (rarely yellowish) and clearly separated from its stipe; the appendix-club in subsp. *orientale* is 1–2 (3) ×, in subsp. *longispathum* 4–6 × as long as its stipe. The peduncle is – in subsp. *orientale* – about half or less than half the petiole, but in subsp. *longispathum* (REICHENB.) ENGLER it is as long as the petiole (i. e., like in *A. alpinum*).

A. creticum differs from *A. alpinum* mainly in shape and colour of the inflorescence (according to PRIME 1980 and GREUTER 1984): *A. creticum* has a pale green to whitish-yellow spathe which is less constricted, more inflated at base and more open than in *A. alpinum* and in the other species; its limb is twice as long as its tube and usually patent. The appendix of the spadix is yellow, fusiform, somewhat attenuate at the base and towards the apex but never distinctly stipitate; the spadix in *A. creticum* is distinctly exserted, the male zone is as long as the female zone or longer (10–20 mm), and the upper sterile flowers are absent or rudimentary.

A. idaeum differs (following the key and description by GREUTER 1984) from *A. alpinum* in the milky white spathe, the fusiform spadix slightly attenuate to both ends but not distinctly stipitate, and the upper sterile flowers being rudimentary or absent.

In the key to the species provided by BOYCE 1993: 57–59 it is impossible to key out typical specimens of *A. alpinum*, because leads 10 and 15 (leading to *A. alpinum*) state that the spathe-tube is not bicoloured on inner surface but uniformly "white or greenish white"; the description of *A. alpinum* (on p. 87) as well as most of the living specimens observed by us show, however, the basal part being pale greenish but the upper one purple.

3. Distribution

TERPÓ 1973 stated that *A. alpinum* is distributed in the eastern part of Central Europe up to Schleswig-Holstein and Danmark. In Danmark it was reported as "*A. maculatum* subsp. *danicum* PRIME", later on, by TERPÓ

1973, as "*A. alpinum* subsp. *danicum* (PRIME) TERPÓ and, in Flora Europaea (PRIME 1980), as "*A. orientale* subsp. *danicum* (PRIME) PRIME". BEDALOV 1973b (and unpubl.), resulting from her morphological, karyological and phytogeographical investigations on (former) Yugoslavian and Danish plants also established that the diploid *Arum* in Danmark belongs to *A. alpinum*. These findings have been confirmed also by NIELSEN & UGELVIG 1986. BEDALOV & GUTERMANN 1982 have shown the distribution of *A. alpinum* in E. Austria where it displays geographic vicariism with *A. maculatum* (present in central and W. and S. Austria). BEDALOV 1973a, b, 1976, 1981, BEDALOV & BRONIĆ 1994 recorded *A. alpinum* for several regions of former Yugoslavia (Vojvodina, Baranja, Serbia, Kosovo, R. of Makedonija, Dinaric parts of Bosnia and Croatia) and for N. Greece and Bulgaria (W. Stara planina). Besides, *A. alpinum* has been recognized in S. Italy (BEURET 1972, 1977, BEDALOV 1980, 1982, 1983, 1984, BEDALOV & al.

Fig. 1. Records of *Arum alpinum* in the southern part of the Balkan Peninsula: R. of Makedonija, Greece and Turkey. – ○ = records from literature (BEDALOV 1976, 1981; GREUTER 1984); ● = present investigations; **O** = herbarium specimens intermediate between *A. alpinum* and *A. orientale*.

1993a, b) and even in the W. Mediterranean area: Corsica, S. France, Spain (LÖVE & KJELLQUIST 1973, BEURET 1977, BEDALOV 1983). Recently, GREUTER 1984 records *A. alpinum* for Crete.

Our studies of different herbarium collections revealed a still larger distribution range of *A. alpinum* in the E. Mediterranean area: it also occurs in continental Greece, and on the island Evvia (= Euboea). The Balkan Peninsula part of its range according to the present state of knowledge is shown by Fig. 1. The other species and subspecies mentioned above also show characteristic and distinct distribution ranges (BEDALOV 1981):

A. italicum is distributed from the Caucasus throughout the Mediterranean region up to the Atlantic coast and to S. England and grows mainly within the eumediterranean vegetation zone (BEDALOV 1973b, 1975a, 1981). *A. maculatum* has a wide distribution in central and W. Europe (TERPÓ 1973, BEDALOV 1973b, 1976, 1977, 1981); in the Balkan Peninsula and in the Mediterranean region it is probably much rarer than given in the literature because it has been mostly confused with *A. alpinum*. KUZMANOV 1993 reports a chromosome count of "2n = 56" for "*Arum alpinum*"; unfortunately, up to now we could not trace neither the locality nor the voucher of this record.

A. orientale subsp. *orientale* has been confirmed so far for Roumania, Bulgaria, S. Serbia, the R. of Makedonija, and NE. Greece (BEDALOV 1973a, b, 1981, 1989, BEDALOV & DRENKOVSKI 1994). It does, however, not reach Austria and is probably also absent from Hungary: The distribution data given by BOYCE 1993: 96: "From Austria (around Vienna) and Poland ..." and on p. 16: "from southern Austria" and his map 6 (p. 95) are all wrong, this mistake probably originating from not considering *A. orientale* subsp. *alpinum* (SCH. & K.) H. RIEDL in HEGI, Fl. Mittel-Eur., 2nd ed., II/1: 333 (1979) as a synonym of *A. alpinum* (see above), missing in BOYCE's synonymy on p. 87. This mistake is evident also in MILL 1984: 47. (The alleged presence of *A. orientale* subsp. *orientale* in Poland is not mentioned in BOYCE's map 6.) – *A. orientale* subsp. *longispathum* is restricted – as to present knowledge – to some Dinaric mountains: Lovćen, Orjen, Mosor, Biokovo and Velebit (BEDALOV 1973a, b, 1975c, 1981, 1989, 1994). – (As the third subspecies, BOYCE 1993 includes subsp. *sintenisii*, a local endemic restricted to NE. Cyprus.)

A. creticum is known only from the islands of Crete and Karpathos in Greece, for SW. Anatolia and some Turkish Islands (BEDALOV 1981, GREUTER & al. 1983, GREUTER 1984, MILL 1984). – *A. idaeum* is endemic to the higher mountains of Crete (GREUTER 1984).

Resulting from these findings, *A. alpinum*, a species described from the Transsylvanian Alps by SCHOTT in 1851 and hundred years later considered a central-european species (TERPÓ 1973), turns out to have a much larger distribution, namely also in the whole mediterranean area.

Recently, BOYCE 1993 presented a map of the total distribution of *A. alpinum* which, however, as to present knowledge, does not consider the large distributional gaps in Central Europe (most of France and of Germany, all of Switzerland, western part of Austria).

4. Herbarium specimens of *A. alpinum* seen

The study is based on material from the following herbaria: Botanički zavod, Prirodoslovno-matematički fakultet, Zagreb, Croatia (ZA); Goulandris Natural History Museum, Kifissia, Athens, Greece (ATH); Botany Institute of the Vienna University, Austria (WU); Botany Institute of the University of Graz, Styria, Austria (GZU); Naturhistorisches Museum Wien (W); Botanische Staatssammlung Munich, Bavaria, Germany (M); Conservatoire Botanique, Genève, Switzerland (G); Institut botanique, Montpellier, France (MPU); Institute of Botany, Charles University, Prague, Czechia (PRC).

Greece:

Crete: Omalos ("Amalos"), rochers ombragés, 24.5.1884, REVERCHON 278, sub *A. cretico* var. *lanceolato* [BOISS. & HELDR., nom. nud., type of *A. italicum* var. *lanceolatum* (BOISS. & HELDR.) ENGL., see above] (ZA, WU, MPU, PRC). – Kissamos, 1884, REVERCHON, sub *A. cretico* var. *lanceolato* (WU). – Recently, GREUTER 1984 established some new localities for this species in Crete (included in the map Fig. 1).

Peloponnisos: Mt. Killini (= Kyllene), 1870, HALÁCSY, sub *A. vulgari* (WU).

Attiki (= Attica): Athens (Athina), sub *A. orientali* et *A. maculato* var. *angustato* ENGL. (M). – Mt. Parnes [= Parnis], 1854, ORPHANIDES 2679, sub *A. vulgari* LAM. (G); 1858, HELDREICH 3101, sub *A. heldreichii* BOISS. (G).

Viotia (= Boeotia): Mt Parnassos, 28.6., s. a., Reliqu. ORPHAN., cur. Th. de HELDR., sub *A. maculato* (WU); Mt Parnassos, 1854, ORPHANIDES 2742, sub *A. orientali* et *A. maculato* et *A. vulgari* (G). – Mt. Ossios, Parnassos, 1854, ORPHANIDES 2659, sub *A. vulgari* et *A. heldreichii* (G). – Livadhia, Parnassos, 1750–1900 msm, 1968, STAMATIADOU 3057, undet., (ATH).

Evvia (= Euboea): Mt. Dhírfis (= Dirphys), Stení, 700–750 msm, STAMATIADOU 8429, undet. (ATH). – Chalkís, BECK, sub *A. orientali* et *A. maculato* var. *angustato* ENGLER (M).

5. The Specimens from Turkey (Around Istanbul)

Whether *A. alpinum* is present around Istanbul as stated by BOYCE 1993: 90 ("... to NW Turkey, map 5, p. 89") or not, in our opinion, remains doubtful and needs further careful investigation. A specimen in herb. G, collected by G. V. AZNAVOUR ("lieux secs, Hauteurs de Tchenguelkeuy"), no. 2033 bis, 14.5.1896, from near Istanbul, sub nom. "*A. orientale* M. B. v. *gratum* ENGL.", revised by R. R. MILL (s. d.) as "*A. maculatum*" and by

P. BOYCE (1987) as "*A. alpinum* (first record for Turkey)" seems to be the basis of BOYCE's opinion. Considering several more specimens from around Istanbul, collected by J. NEMETZ ("Flora Byzantina", from the "environments of Constantinople", in herb. WU and GZU), we would like to utter some doubts whether these specimens represent *A. alpinum* (Grid system like in P. H. DAVIS: Flora of Turkey):

A2 (E) prov. Istanbul: "Thérapia" [= Tarabiya], forêt, 17. IV. 1897: det. K. H. RECHINGER as "*A. italicum*", det. R. R. MILL 1981 as "*A. maculatum*" (WU, GZU); a third specimen from the same gathering, det. as "*A. byzantinum*" by R. R. MILL 1981 (WU), looks, in our opinion, very similar.

A2 (E) prov. Istanbul: Belgrad forest [= Belgrat ormani], Bahçeköy, 14. VI. 1896: det. K. H. RECHINGER as "*A. italicum*", det. R. R. MILL 1981 as "*A. byzantinum*" (WU).

A2 prov. Kocaeli: Tuzla, 25. IV. 1897: det. K. H. RECHINGER as "*A. italicum*", det. R. R. MILL 1981 as "*A. byzantinum*" and quoted in MILL 1984: 46 (wrongly as "15. IV. 1897") (WU).

A2 prov. Kocaeli: Pendik, 23. IV. 1897: det. K. H. RECHINGER as "*A. italicum*", det. R. R. MILL 1981 as "*A.* cf. *byzantinum*" (WU).

All these specimens, in our opinion, are likely to be conspecific. Evidently, they do not belong to *A. italicum*, a species present in the environments of Istanbul as well. The discoid rhizome (though scanty, i. e. not preserved in all specimens) disagrees with *A. byzantinum*. (The description of *A. byzantinum* given by BOYCE 1993: 67 closely follows MILL 1984: 46 who includes the NEMETZ specimens cited above into his description!) Rather probably, as to our knowledge for the time being and due to the scanty material, these NEMETZ specimens from near Istanbul belong to *A. orientale* (subsp. *orientale*) rather than to *A. alpinum*: The peduncle (scape) is very short, half of the petiole or shorter; the leave blade is often more elongate than in typical *A. alpinum*; the limb of the spathe is 3–4 times as long as its tube, and the club of the spadix appendix is well distinct. – It must be noted that MILL 1984 does not mention *A. alpinum* at all and that he does not record *A. orientale* from the Istanbul region. (The question, whether there are 2 [RECHINGER 1938: 69] or 3 [MILL 1984] or 5 [BOYCE 1993] species of *Arum* growing around Istanbul seems to be so far still unanswered and unanswerable.)

The descriptions of these species given by BOYCE 1993: 87–94 report also some size differences: of tuber, petiole, leaf blade, spathe-tube and especially spathe length (*A. alpinum*: up to 14 cm; *A. orientale*: more than 14,5 cm!), *A. orientale* generally having the higher values than *A. alpinum*. Our NEMETZ material in these respects, however, shows relatively low values, thus being more close to *A. alpinum* than to *A. orientale* (subsp. *orientale*). The shape of the staminate flower zone, on the other hand how-

ever, is short, 2–4 mm long, "quadrate", thus, according to BOYCE's descriptions, fitting much better to *A. orientale* than to *A. alpinum*. (We cannot and we must not restrain from remarking the incongruence or contradiction between the description of *A. alpinum* and the relevant figures in BOYCE 1993: 88: "staminate flowers in a cylindric zone 5–6 mm long, 3–4 mm wide"; the figures, in contrast, show a quadrate or even shorter zone, 4–5 mm long and 6–7 mm wide!).

In fairness, we emphasize that we found one correct statement in BOYCE 1993: 92 which we fully agree with: "The status of many eastern European populations of *A. orientale* has yet to be finalized. ... much remains to be done." This is true likewise for the Istanbul area at the border between Europe and Asia. Our observations on the specimens from the Istanbul region confirm our opinion on the rather close affinity of *A. orientale* and *A. alpinum*. We wonder, therefore, if natural relations are taxonomically presented best by putting *A. alpinum* into a subsection of its own (BOYCE 1993: 55, 85, 90). The description of *A.* subsect. *Dischroochiton* does not include *A. orientale* subsp. *sintenisii*; the only substantial subsectional differential character remaining in his subsectional descriptions is the presence (subsect. *Dischroochiton*) or lack of scent (subsect. *Alpina*) of the inflorescence, respectively. That's why it is notable that *A. alpinum* near Vienna (Austria) is never scentless but shows remarkable foetid odour (diagnostic character of "subsect. *Dischroochiton*"), smelling exactly "moderately of horse-dung" (like stated by BOYCE for *A. orientale*)!

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